National Synchrotron Light Source II

Project Progress Report

October 2009

report due date:
November 20, 2009

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Upton, New York 11973

OVERALL ASSESSMENT

The National Synchrotron Light Source II project continued to make excellent progress on all fronts while redoubling its emphasis on achieving a best-in-class safety program. The Project Director in his capacity as the Associate Laboratory Director for Light Sources commissioned an independent construction safety investigation to evaluate the serious injury that occurred at the ring building construction site as well as actions taken in response to the incident. The investigation will also review the adequacy of contractual safety requirements, the safety incentive program, and implementation of the construction safety program. A corrective action plan will be developed to address the Judgments of Need identified in the final report from the investigation team.

Construction of the ring building and chilled water plant expansion made substantial progress. Forming and concrete pouring of footings and foundations for the buildings and tunnel walls and floors for the storage ring are ahead of schedule. Excellent progress was made for the utility tunnel and vehicle tunnel of the ring building. Material procurement contracts for electrical gear are in fabrication and are expected to be delivered ahead of schedule. Design and procurement activities for the Lab Office Buildings (LOBs) continued as scheduled.

At the sixth meeting of the Accelerator Systems Advisory Committee, the committee found an enormous amount of progress had been made since the last meeting in March. Accelerator Systems continued to finalize production orders, test prototypes and first production articles, and prepare for magnet–girder integration. Contracts for all magnets were awarded and the production orders for the vacuum chamber extrusions were placed. In October, substantial progress was made in vacuum, power supply, and RF systems. Progress on procurement of the linac, booster, and damping wigglers continued.

A successful review of the Conceptual Design Reports (CDRs) provided a validation of adequacy and maturity for the planned scope, cost, schedule, and staffing of the six project beamlines. Progress in both the 1 nm and 0.1 meV R&D areas continued.

Overall, project performance remains satisfactory and the activities funded by the American Recovery and Reinvestment Act (ARRA) continue to be on schedule and on budget.

The overall project schedule from completion of the near-term planning now projects an early completion date as early as February 2014. A careful analysis of critical path, near-critical path, and schedule floats is being conducted.

SCHEDULED EVENTS 2009–2010

Conventional Facilities Advisory Committee (CFAC)	Nov. 9–10
BNL EVMS Self Assessments	Nov 16–18
DOE Inspector General Audit	Nov 30 – Dec 11
Project Advisory Committee (PAC) meeting	Dec 10–11
DOE Review of the NSLS-II Project	Feb 9–11

ACCELERATOR SYSTEMS DIVISION (ASD)

Efforts to finalize the booster procurement documents, including drawings and specifications of BNL-supplied systems, continued.

Design has begun on the booster extraction kicker prototype. A modular design will keep the kicker voltage below 40 kV. The specification of magnets for the transfer lines is in progress. The transfer line trajectory correction system has been optimized. Good progress has been made in demonstrating sufficient dynamic aperture of the booster.

The orders for production of the vacuum chamber extrusions of the dipole and multipole cross-sections have been placed, and the weld development at APS for the dipole extrusion is complete. After several iterations, two vendors have produced acceptable machined dipole extrusions. Machining of multipole chambers has started, as well as the weld development for multipole extrusions. The bi-metallic flange vendor has delivered sufficient production flanges for weld development and for the start of production welding. The vacuum pump system definition has been finalized after several tests and assessments based on the latest vacuum chamber geometry. Several design options of the stainless chamber design, including integrated absorber systems, were developed and compared. The final decision on these systems will conclude the design of the vacuum system. Work has begun on bending chamber design and details of the transport line vacuum. The vacuum instrumentation test bed—with vacuum gauges, RGA, titanium power supplies, and ion pump power supplies—has been set up to evaluate the vendor products and to develop the interface protocol with the Controls group. The Operational Readiness Evaluation of the clean room for chamber assembly was conducted. Some minor items and fire detectors are to be installed before operations begin.

For insertion devices, the effort to converge the damping wiggler specifications is ongoing. Procurement documents have been updated. Production of the Hall probe bench in industry is proceeding well. For calibration arrays, a full 30-period fixed-gap "Halbach" array and C-structure that integrates existing 38VH magnets have been developed. The aluminum C-frame allows for Wire and Hall Probe scans while maintaining sufficient structural rigidity for magnetic stability under load. Both pole types are being machined, and the permanent magnets are on hand. Machining job requests for a magnet array holder and C-frame structural parts have been issued to Central Shops, and material procurement proceeds. Insertion device control element solutions have been investigated, and decisions on main components have been made. The next step is to test prototype systems.

The electrical engineering group continued to develop prototypes and test various power supply components. The component design for the main dipole power supply has been optimized. The prototypes for the multipole and corrector power supply current regulator boards and chassis are ready for installation in the test rack. The second version of the power control board (PCB) for the prototype power supply interface has been delivered by the vendor. Software has been developed for precise temperature control of the 18-bit DAC. Preliminary tests show we can maintain the ±0.1°C temperature stability specification. Engineering work is complete on the new two-channel corrector magnet current regulator boards, and the PCB modifications for the new board are being developed. Design work continues on a system to inspect incoming 200-Amp DCCTs. This system, which incorporates a calibration standard, will allow automated testing of all 1,800 DCCTs. Parts are on order for this system, and control chassis are being assembled. Prototypes for the final design of the equipment enclosures were received for testing. Work continued on conceptual designs for new magnetic field measurement systems that might be needed for inspecting incoming production magnets.

The RF group analyzed the coupling requirements of the CESR cavity across the expected machine configurations from baseline (single installed cavity, 2.4 MV, 300 mA) through the fully built-out system with four cavities providing 4.8 MV for a 500 mA beam and a total beam power loss of 1 MW. The conclusion is that coupling, which is a fixed mechanical design feature of the niobium resonator, must be optimized for the four-cavity fully built-out stage of NSLS-II; this implies that operation with just one cavity will have significantly limited performance. The NSLS-II RF activities are supported by several SBIR activities, the latest being development of the advanced VORPAL code for the design of resonant structures. Measurements on the booster cavities have been performed to provide calibration curves, which are needed in order to control the HOM frequencies by varying the cooling-water temperature (see Fig. 1). Booster cavity stands have been modified for a beam height of 1.2 m. The pressure stability analysis for the storage ring superconducting cavity has entered the third and final stage. Analysis confirms that the CESR cavity will not meet ASME code with a cavity hemisphere thickness of 2.5 mm, the original Cornell design. The wall thickness must be increased to 3 mm to increase the "plastic collapse" numbers. Contacts to vendors have been made to ensure the manufacturability and integrity of the design with such changes.

The most important issue of NSLS-II instrumentation is the in-house development of BPM (beam position monitor) electronics as an alternative to a vendor-provided design. The evaluation of this alternative approach has started, and so far the assessment is encouraging.

The efforts on Safety Systems included programming the Pentant 1 Area Search using the test and demonstration system. The safety functions have been sent to a contractor (SIS) for analysis. Purchase orders have been submitted for three prototypes of area monitors from different vendors (this is discussed further in the CFD report). The PLCs and hardware are ready for testing when the area monitors arrive.

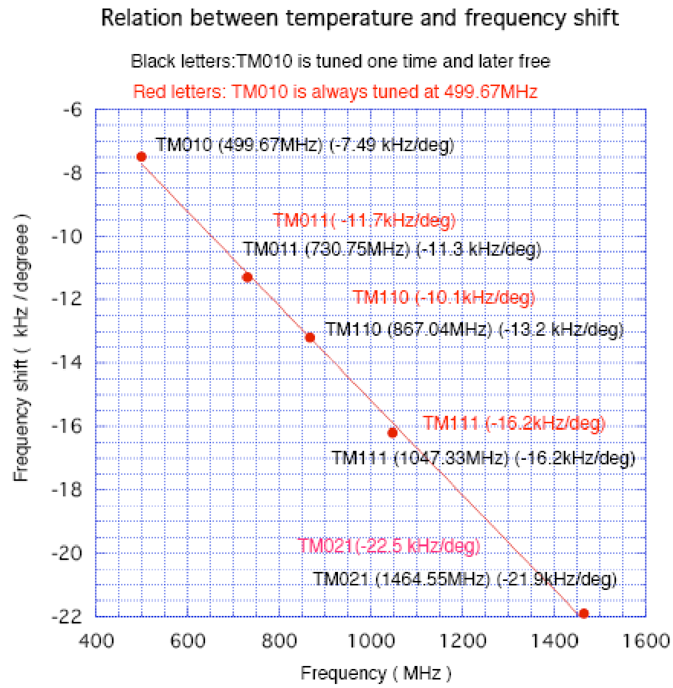


Fig. 1: Frequency of HOMs in the booster cavity vs. fundamental frequency.

EXPERIMENTAL FACILITIES DIVISION (XFD)

Following successful completion of the design safety reviews and submission of the Conceptual Design Reports in September, the review of conceptual designs for the six project beamlines was conducted on October 13–14. The committee evaluated design adequacy for meeting the scientific scope; design maturity for proceeding to detailed designs; cost and schedule; staffing levels for carrying out the design and construction; risks and mitigation plans; and interface issues with other parts of the project. Overall, the review provided independent assessment and critical inputs to the beamline groups that will help further the beamline detailed design work by the NSLS-II XFD in the coming year. The committee report is expected at the end of November.

In the R&D area, further progress was made in the high-energy-resolution test experiment being conducted at NSLS X16A. The two Collimating-Dispersing-Wavelength-selecting (CDW) optical setups were individually aligned, allowing combined tests of the CDW–CDW scheme to proceed.

In the high spatial resolution R&D area, the assembly of the new deposition chamber for multilayer Laue lens (MLL) is being completed, and integrated testing at the manufacturer's facility has begun (Fig. 2).

The new x-ray reflectometer for multilayer growth characterizations has been installed and tested in the MLL deposition laboratory. Using an existing thin-film growth chamber on loan from the Condensed Matter Physics department at BNL, the R&D group has completed a test run to grow the first MLL at BNL. Such test runs pave the way to design of the final control program for depositions of future MLLs in the new MLL deposition chamber.

Fig. 2: The new deposition chamber for multilayer Laue lens growth is undergoing integrated testing at the manufacturer's facility.

CONVENTIONAL FACILITIES DIVISION (CFD)

Substantial progress was made in construction of conventional facilities during October, concurrent with response to the September 30 construction accident that resulted in a serious leg injury to a worker. A stand-down of related work activities was put in place until corrective measures were identified, demonstrated, and implemented, enabling authorization to resume rebar handling operations at the site. An independent investigation of the accident has been commissioned and is discussed further in the ESH section of this report.

The ring building footprint is rapidly becoming well defined, as the perimeter and interior column footings have been poured for ¾ of the building circumference. The storage ring tunnel is also becoming a prominent feature of the site, as tunnel walls for pentant 1 are now nearly complete and the ring floor has been extended well into pentant 2. Preparations are underway to begin pouring the first section of tunnel roof in November. Progress also continues on the footings and foundations for the interior courtyard buildings, including the RF compressor building, injection building, and service buildings 1, 2, and 3.

The utility tunnel and vehicle tunnel of the ring building have also seen substantial additional progress. The utility tunnel roof, which forms the floor slab for the storage ring and experimental floor, will be poured in early November. This will enable the placement of backfill around the tunnel and of building footings and slabs in the center of pentant 2, in mid to late November. Vehicle tunnel walls are complete and adjacent retaining walls are being formed and poured.

Installation of utilities continues to move forward, as all site utility layouts have been coordinated. The installation of the exterior water, storm, and sanitary piping is nearly complete; installation of the interior courtyard storm, sanitary, and electrical ductbank is getting underway.

Construction of the Chilled Water Plant Expansion is progressing rapidly: the building basement slab and pipe pit were completed, and formwork for basement walls is taking shape. The Electrical Substation Expansion project manholes were installed, and trenching for the electrical ductbank began. The Chilled Water Piping construction package is underway and all major long-lead materials have been ordered and scheduled for delivery to the site.

The accelerated design of the LOBs is nearing completion. Final bid issue drawings are expected from the A/E on November 18. The A/E was given additional time to finalize the design package and verify it is fully coordinated, since the bid issue drawings and specs will not be needed until early December, when approval of the RFP is anticipated.

Inspection and delivery of the 15 kV switchgear was completed in October, two months ahead of schedule. All remaining material procurement contracts for electrical gear—the 8-unit substations, main substation transformer, and 69 kV circuit breaker—are in fabrication and are progressing well. Arrangements are being made for in-process inspections, and delivery of each item is expected about two months earlier than originally planned.

The ring building contractor had been running slightly behind schedule on some activities but has made up most of the lost time. Concrete activities, which are the critical path for the ring building, are now running slightly ahead of schedule. A Project Change Request (PCR) has been processed to incorporate the contractor's actual schedules into the performance baseline for the Chilled Water Plant Expansion, Electrical Substation Expansion, and Chilled Water Piping. Overall, CFD has made up much of the slight previous schedule deficit and is now on schedule. Given the accelerating pace of ring building construction, conventional construction will likely move ahead of schedule in the coming months, if winter weather is cooperative.

Figure 3: Installing the water main.

ENVIRONMENT, SAFETY, AND HEALTH (ESH)

The independent investigation of the serious construction injury that occurred at the ring building site on September 30 continued during October. Bundles of rebar were being moved from a storage lay-down area to a crane access area with a "LULL" fork truck, when a laborer who was guiding the load was struck by a bundle of rebar and sustained a broken right leg below the knee. He was transported to a local hospital for treatment of his injuries and is expected to make a full recovery.

The investigation's scope will be consistent with a DOE "Type B Accident Investigation" as outlined in DOE Order 225.1A. This report will identify root and contributing causes as well as Judgments of Need that will be addressed by the Project and the Laboratory. A corrective action plan will be developed to address the Judgments of Need identified by the investigative team.

The Project is procuring three prototype area radiation monitors to test at NSLS. Results of the testing will help to refine the specifications for procurement of the remaining units in FY11 that will be installed in the ring and injection buildings. Purchase orders were placed during October for three radiation area monitoring units, one from Far West Technology and one from Apantec, and the third from Mirion Technologies for a similar system. Delivery is expected for two units by early December and the third in early February. The units will be installed on the NSLS experimental floor near the booster-to-VUV injection line. Power and network connections have been established for the units, thereby permitting a simple installation and remote monitoring capability of instrument performance for most of FY 10.

PROCUREMENT ACTIVITIES

Contract awards for the sextupole, corrector, dipole, and large-aperture magnets were made in October. All major magnet acquisitions have been completed and contracts are in place. The linac RFP has been submitted to DOE for review.

COST/SCHEDULE BASELINE STATUS

The cumulative Cost Performance Index (CPI) has improved to 1.04 and the cumulative Schedule Performance Index (SPI) improved to 0.96. Both cumulative indices have green status and are well within the DOE acceptable range. The CPI for the month is 1.40 (red status) because October's monthly close includes 10 fewer days of labor due to close-out of the fiscal year on September 30. The project's monthly SPI is 1.37 (red status).

A preliminary update to the critical path resulted from the near-term planning process. The critical path runs through ring building construction up through BOD of pentant 3 to storage ring installation, test, and commissioning. The currently projected early completion date is February 2014, about 4 months earlier than the current baseline. Near-critical-path items with fewer than 50 days of total float include: SR vacuum system, pumps and valves; injection straight vacuum; transport line magnets and vacuum components; SR equipment enclosures; injection pulsed magnets; SR main dipole power supplies; and SR RF systems.

RECENT HIRES

Vincent DeAndrade – Asst. Materials Scientist – SRX Beamline, XFD
Richard Lynch – Mechanical Designer – Mechanical Engineering, ASD
Lee Suarez – Electronic Technician – Electrical Engineering, ASD

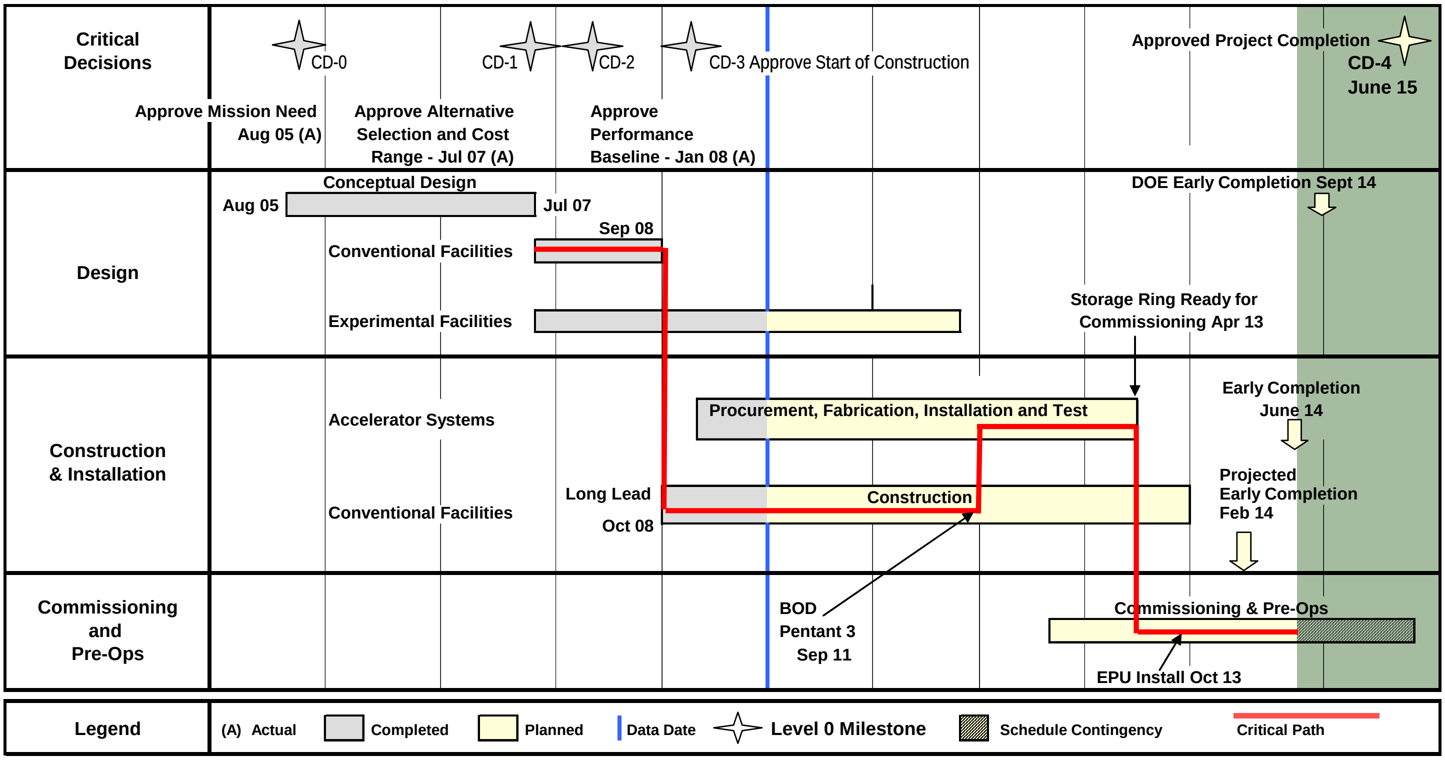
RECENT PROJECT ACCOMPLISHMENTS

- Contract awards for the sextupole, corrector, dipole, and large-aperture magnets were made in October.
- Orders for vacuum chambers have been placed.
- Component design for the main dipole power supply has been optimized.
- An external review of the conceptual designs for the six project beamlines was conducted in October, with useful feedback.
- The new deposition chamber for MLL lens growth is undergoing integrated testing at the manufacturer's facility.
- Inspection and delivery of the 15 kV switchgear was completed two months ahead of schedule.
- Purchase orders were placed in October for three radiation area monitors for testing.
- Near-term planning, including comprehensive review of the accelerator schedule, was completed.

PROJECT DESCRIPTION

The NSLS-II project is being carried out to design and build a world-class user facility for scientific research using synchrotron radiation. The project scope includes the design, construction, and installation of the accelerator hardware, civil construction, and experimental facilities required to produce a new synchrotron light source. It will be highly optimized to deliver ultra-high brightness and flux and exceptional beam stability. These capabilities will enable the study of material properties and functions down to a spatial resolution of 1 nm, energy resolution of 0.1 meV, and with the ultra-high sensitivity necessary to perform spectroscopy on a single atom.

DOE Project Milestone Schedule



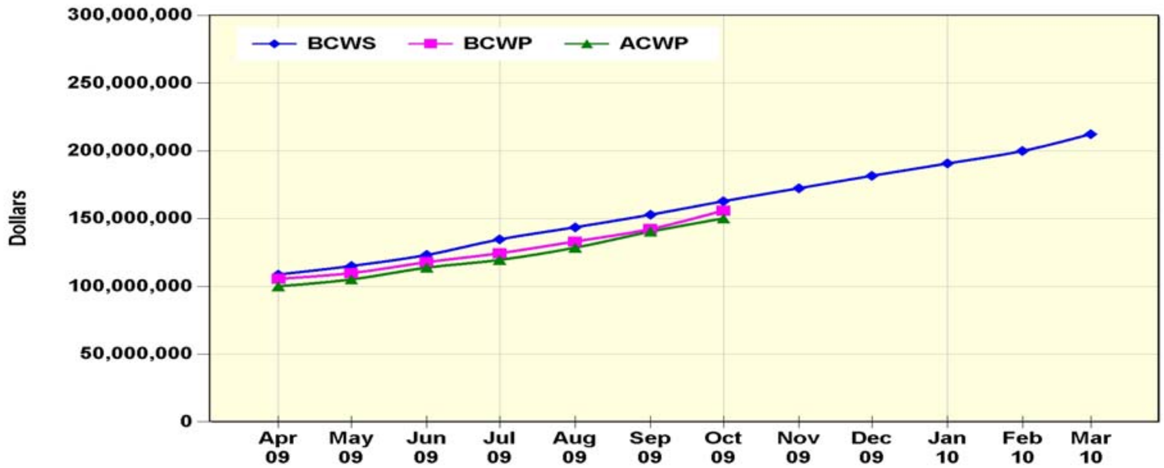
Funding Profile (revised to reflect ARRA funding)

Fiscal Year	NSLS-II Funding Profile ($M)										
	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	TOTAL
R&D			3.0	20.0	10.0	2.0	0.8					35.8
OPC	1.0	4.8	19.0									24.8
PED			3.0	29.7	27.3							60.0
Construction					216.0	139.0	151.6	151.4	46.9	26.3		731.2
Pre-Ops							0.7	7.7	24.4	22.4	5.0	60.2
Total NSLS-II Project	1.0	4.8	25.0	49.7	253.3	141.0	153.1	159.1	71.3	48.7	5.0	912.0

Key Personnel

Title	Name	Email	Phone
Federal Project Director	Frank Crescenzo	crescenzo@bnl.gov	631-344-3433
NSLS-II Project Director	Steve Dierker	dierker@bnl.gov	631-344-4966

EV for WBS 1 (NSLS-II Project) as of October 31, 2009



Cumulative to Date (K$)	Apr 09	May 09	Jun 09	Jul 09	Aug 09	Sep 09	Oct 09	Nov 09	Dec 09	Jan 10	Feb 10	Mar 10
BCWS	108,753	115,036	123,163	134,682	143,605	152,869	162,854	172,374	181,577	190,618	199,898	212,293
BCWP	105,508	109,802	117,841	124,463	133,133	142,268	155,908					
ACWP	100,000	105,100	113,794	119,538	128,528	140,413	150,173					

Project as of 10/31/09	Current Period	Cum-to-date
Plan (BCWS) $K	9,986	162,854
Earned (BCWP) $K	13,640	155,908
Actual (ACWP) $K	9,760	150,173
SV $K	3,655	-6,946
CV $K	3,880	5,736
SPI	1.37	0.96
CPI	1.40	1.04
Budget at Completion $K (PMB)		757,534
Planned % Complete		21.5%
Earned % Complete		20.6%
Mgmt Rsrv/Cont. as % of BAC remaining		25.7%
Mgmt Rsrv/Cont. as % of EAC remaining		24.5%

Milestones – Near Term	
Description	Baseline Date
CD-3 Approve Start of Construction	Feb09 Actual=Jan09✓
100% Conventional Facility Title II Design Complete	Aug 2008✓
Begin Site Preparation	Nov 2008✓
Issue Ring Building NTP	Jun09 Actual=Mar09✓
Contract Award for Booster System	Mar 2010
40% Accelerator Design Complete	Feb 2008✓
60% Conventional Facility Title II Design Complete	May 08✓
Conventional Facility Site Prep Complete	Jan09 Actual=Feb09✓
Accelerator SR Magnet Design Complete	Feb 2009✓
Exp. Facilities – Prelim. Design End Stations 1 Complete	June 2010

✓ = Completed; on schedule, unless otherwise noted

Schedule Performance Index, Project to Date:

SPI **0.96**

Cause & Impact: No reportable variance.
Corrective Action: None Required.

Cost Performance Index, Project to Date:

CPI **1.04**

Cause & Impact: No reportable variance.
Corrective Action: None Required.

ACWP = Actual Cost of Work Performed
BAC = Budget at Completion
BCWP = Budgeted Cost of Work Performed
BCWS = Budgeted Cost of Work Scheduled
CPI = Cost Performance Index (BCWP/ACWP)

EV = Earned Value
IPT = Integrated Project Team
PMB = Performance Measurement Baseline
SPI = Schedule Performance Index
WBS = Work Breakdown Structure

SPI or CPI in the range of:	
	0.9 – 1.15 is green
	0.85 – 0.89 or 1.16 – 1.25 is yellow
	<0.85 or >1.25 is red

Nine PCRs were implemented in October:

PCR #	Area	Δ cost	Title or Description	PCR #	Area	Δ cost	Title or Description
PCR_09_073	ASD	$1.7M	Revision of Inj. System Transport Lines	PCR_10_095	CFD	$1.9M	Additional LOB Engineering and Design
PCR_09_080	ASD	$1.2M	SR Stainless Steel Vacuum Chambers	PCR_10_096	PRJ	-0-	Area Monitoring Prototype
PCR_09_089	ASD	$7.8M	ASD Near-Term Planning Cost/Schedule Revisions	PCR_10_097	PRJ	-0-	Add QA Milestones to Project Schedule
PCR_09_092	ASD	($85.6K)	Design Evolution of SR Correctors	PCR_10_100	CFD	-0-	Integrate Contractor Schedule into NSLS-II Master Schedule
PCR_09_093	ASD	$123.5K	Implement Third Chromatic Knob for SR				

ARRA DETAILS

This Recovery Act project will provide advanced funding for NSLS-II construction, create jobs, and substantially reduce the cost and schedule risks for the project. The overall schedule for the ring building completion will not be accelerated; however, Recovery Act funds allow for re-ordering of the work sequence with a six-month acceleration of the injection building completion. Acceleration of the injection building allows for earlier installation and commissioning of the injector, which had been close to critical path. This addition of schedule float will significantly reduce the schedule risk for the accelerator. In addition, Recovery Act funds will accelerate completion of the Laboratory Office Buildings by 15 months, which will enable the project to maximize the cost advantage of the depressed construction market.

ARRA$ as of 10/31/09	Current Period	Cum-to-date
Plan (BCWS) $K	1,562	21,705
Earned (BCWP) $K	4,069	19,798
Actual (ACWP) $K	4,061	18,813
SV $K	2,507	-1,907
CV $K	7,491	985

ARRA Milestones		
Description	Baseline Date	Status
BNL review and approval of heat exchangers (HX).	7/31/2009	Some HXs were approved. Awaiting resubmittal of non-approved units.
Fabricate concrete embeds, Phase 3.	8/26/2009	Majority delivered. Balance due 11/6/09.
Install ductbank storm pump station to HHR, HH3.	9/2/2009	Waiting for vehicle tunnel to be backfilled.
Pour concrete walls for vehicle tunnel.	9/10/2009	Milestone completed 9/24/09.
Pour cooling tower walls and piers.	9/22/2009	Awaiting courtyard utility installation.
Pour tunnel walls at Ratchet 23A.	10/5/2009	Completed 10/16/09.
Start chilled water concrete foundations.	10/7/209	First pour completed.
Install manhole G6C.	10/13/2009	Deferred due to utility routing change.
Pour tunnel slab CL 120-006.	10/20/2009	Completed 9/29/09.
Pour tunnel slab CL 006-012.	10/20/2009	Completed 10/7/09.
Backfill utility tunnel and vehicle tunnel.	10/27/2009	Utility tunnel backfill planned for week of 11/9/09.

The IPT can find further details on NSLS-II cost and schedule data at http://www.bnl.gov/nsls2/project/IPT/default.asp.

CLASSIFICATION (When Filled In)

CONTRACT PERFORMANCE REPORT
FORMAT 1 - WORK BREAKDOWN STRUCTURE

FORM APPROVED
OMB No. 0704-0188

1. CONTRACTOR	2. CONTRACT	3. PROGRAM	4. REPORT PERIOD
a. NAME Brookhaven Science Associates	a. NAME	a. NAME NSLS_EV8 - NSLS II Project	a. FROM (YYYYMMDD) 2009 / 10 / 01
b. LOCATION (Address and ZIP Code) Brookhaven National Laboratory, Upton,NY	b. NUMBER	b. PHASE	b. TO (YYYYMMDD) 2009 / 10 / 31
	c. TYPE / d. SHARE RATIO	c. EVMS ACCEPTANCE NO YES X (YYYYMMDD)	

5. CONTRACT DATA

a. QUANTITY	b. NEGOTIATED COST	c. ESTIMATED COST OF AUTHORIZED UNPRICED WORK	d. TARGET PROFIT/ FEE	e. TARGET PRICE	f. ESTIMATED PRICE	g. CONTRACT CEILING	i. DATE OF OTB/OTS (YYYYMMDD)
1	912,000,000	0	0	912,000,000	0	0	

8. PERFORMANCE DATA

ITEM (1) WBS[2] / WBS[3] / Control Acct	Current Period: Budgeted Cost Work Scheduled (2)	Budgeted Cost Work Performed (3)	Actual Cost Work Performed (4)	Variance Schedule (5)	Variance Cost (6)	Cumulative to Date: Budgeted Cost Work Scheduled (7)	Budgeted Cost Work Performed (8)	Actual Cost Work Performed (9)	Variance Schedule (10)	Variance Cost (11)	At Completion: Budgeted (14)	Estimated (15)	Variance (16)
1.01 Project Management													
1.01.01 Project Management													
WBS[3]Totals:	148,155	148,155	74,367	0	73,787	2,579,018	2,579,018	2,524,220	0	54,798	7,445,412	7,445,412	0
1.01.02 Environmental, Safety & Health													
WBS[3]Totals:	82,349	82,349	79,842	0	2,507	1,774,834	1,774,834	2,056,290	0	-281,456	6,154,591	6,454,591	-300,000
1.01.03 Project Support													
WBS[3]Totals:	716,985	716,985	624,644	0	92,341	14,408,828	14,408,828	14,570,306	-0	-161,478	37,878,194	39,305,194	-1,427,000
1.01.04 Quality Assurance													
WBS[3]Totals:	54,167	54,167	26,402	0	27,764	1,065,862	1,065,862	733,314	0	332,548	3,073,212	3,073,212	-0
1.01.05 Configuration Management & Document Control													
WBS[3]Totals:	28,223	28,223	14,931	0	13,292	667,105	667,105	519,302	0	147,803	1,972,567	1,972,567	0
WBS[2]Totals:	**1,029,879**	**1,029,879**	**820,187**	**0**	**209,692**	**20,495,647**	**20,495,647**	**20,403,432**	**-0**	**92,215**	**56,523,975**	**58,250,975**	**-1,727,000**
1.02 R&D and Conceptual Design													
1.02.01 Accelerator Systems R&D													
WBS[3]Totals:	123,776	50,658	33,637	-73,118	17,021	9,349,823	8,759,835	9,127,407	-589,988	-367,572	11,460,076	11,460,076	-0
1.02.02 Experimental Systems R&D													
WBS[3]Totals:	203,152	185,212	246,730	-17,940	-61,518	11,220,562	10,549,134	9,572,573	-671,428	976,561	19,166,550	19,163,545	3,005
1.02.03 Conceptual Design - Accelerator Systems													
WBS[3]Totals:	0	0	0	0	0	12,998,214	12,998,214	12,953,517	0	44,697	12,998,214	12,998,214	0
1.02.04 Conceptual Design - Experimental Facilities													
WBS[3]Totals:	0	0	0	0	0	709,445	709,445	712,450	0	-3,005	709,445	712,450	-3,005
1.02.05 Conceptual Design - Conventional Facilities													
WBS[3]Totals:	0	0	0	0	0	3,886,952	3,886,952	3,872,878	0	14,074	3,886,952	3,886,952	0
1.02.06 Conceptual Design - Project Management & Support													
WBS[3]Totals:	0	0	0	0	0	7,086,188	7,086,188	7,325,314	0	-239,126	7,086,188	7,325,314	-239,126
1.02.07 Project Management - R&D													
WBS[3]Totals:	35,352	35,352	7,998	0	27,354	4,706,438	4,706,438	4,749,003	0	-42,565	5,305,339	5,066,213	239,126
WBS[2]Totals:	**362,280**	**271,222**	**288,365**	**-91,058**	**-17,143**	**49,957,622**	**48,696,206**	**48,313,142**	**-1,261,415**	**383,064**	**60,612,763**	**60,612,763**	**-0**
1.03 Accelerator Systems													
1.03.01 Accelerator Systems Management													
WBS[3]Totals:	98,784	98,784	57,160	0	41,624	2,281,476	2,281,476	2,095,480	0	185,996	6,019,099	6,019,099	-0
1.03.02 Accelerator Physics													
WBS[3]Totals:	231,865	231,865	105,507	0	126,359	2,990,112	2,990,112	2,473,516	0	516,597	10,071,767	10,071,767	-0
1.03.03 Injection System													
WBS[3]Totals:	203,966	172,756	81,864	-31,210	90,892	2,089,804	1,705,294	1,258,072	-384,510	447,222	42,691,628	42,691,628	-0
1.03.04 Storage Ring													
WBS[3]Totals:	958,428	1,266,746	828,042	308,318	438,704	15,417,303	13,475,823	13,108,186	-1,941,480	367,637	148,935,726	152,095,726	-3,160,000
1.03.05 Controls Systems													
WBS[3]Totals:	308,620	654,629	195,835	346,010	458,795	3,938,487	3,250,741	3,176,381	-687,746	74,360	20,207,065	20,537,065	-330,000
1.03.06 Accelerator Safety Systems													
WBS[3]Totals:	42,101	42,304	32,988	203	9,317	676,493	640,008	533,851	-36,484	106,158	4,471,232	4,471,232	-0
1.03.07 Insertion Devices													
WBS[3]Totals:	76,729	40,913	18,989	-35,816	21,925	1,228,595	890,810	452,753	-337,784	438,057	24,225,288	25,525,288	-1,300,000
1.03.08 Accelerator Fabrication Facilities													
WBS[3]Totals:	277,784	268,935	239,972	-8,849	28,962	5,195,857	3,838,362	3,850,806	-1,357,495	-12,444	6,961,411	7,381,411	-420,000
WBS[2]Totals:	**2,198,278**	**2,776,933**	**1,560,355**	**578,655**	**1,216,577**	**33,818,125**	**29,072,626**	**26,949,044**	**-4,745,500**	**2,123,582**	**263,583,217**	**268,793,217**	**-5,210,000**
1.04 Experimental Facilities													
1.04.01 Experimental Facilities Management													
1.04.01 Experimental Facilities Management	89,517	89,517	61,701	0	27,816	1,592,565	1,592,565	1,979,443	0	-386,878	4,568,673	5,367,673	-799,000
WBS[3]Totals:	89,517	89,517	61,701	0	27,816	1,592,565	1,592,565	1,979,443	0	-386,878	4,568,673	5,367,673	-799,000
1.04.02 Standard Local Controls & Data Acquisition Systems													
1.04.02 Standard Local Controls & Data Acquisition Systems	0	1,295	0	1,295	1,295	21,887	12,951	0	-8,936	12,951	69,585	69,585	-0
WBS[3]Totals:	0	1,295	0	1,295	1,295	21,887	12,951	0	-8,936	12,951	69,585	69,585	-0
1.04.05 User Instruments													
WBS[3]Totals:	242,196	243,772	156,729	1,576	87,044	3,265,198	3,180,284	2,129,195	-84,914	1,051,089	63,573,084	64,159,084	-586,000
1.04.06 Front End User Requirements Development													
1.04.06 Front End User Requirements Development	0	0	0	0	0	456	456	1,205	-0	-749	456	1,205	-749
WBS[3]Totals:	0	0	0	0	0	456	456	1,205	-0	-749	456	1,205	-749
1.04.07 Optics Labs													
WBS[3]Totals:	0	0	596	0	-596	831,771	633,098	553,383	-198,674	79,715	2,072,162	2,072,162	0
WBS[2]Totals:	**331,713**	**334,584**	**219,025**	**2,871**	**115,559**	**5,711,877**	**5,419,353**	**4,663,225**	**-292,524**	**756,128**	**70,283,961**	**71,669,710**	**-1,385,749**
1.05 Conventional Facilities													
1.05.01 Conventional Facilities Management													
1.05.02 Conventional Facilities Engineering and Design													
WBS[3]Totals:	3,532,941	3,420,775	124,340	-112,166	3,296,435	18,146,660	17,995,350	15,350,675	-151,309	2,644,675	22,563,410	22,678,749	-115,340
1.05.03 Conventional Facilities Construction													
WBS[3]Totals:	2,283,048	5,630,290	6,598,550	3,347,242	-968,260	30,161,525	29,853,759	30,257,575	-307,766	-403,815	217,414,846	236,608,846	-19,194,000
1.05.04 Integrated Controls & Communications													
1.05.04 Integrated Controls & Communications	0	0	0	0	0	139,236	0	13,594	-139,236	-13,594	561,273	561,273	0
WBS[3]Totals:	0	0	0	0	0	139,236	0	13,594	-139,236	-13,594	561,273	561,273	0
1.05.05 Standard Equipment													
1.05.05 Standard Equipment	0	0	0	0	0	0	0	0	0	0	1,025,586	1,025,586	0
WBS[3]Totals:	0	0	0	0	0	0	0	0	0	0	1,025,586	1,025,586	0
1.05.06 Conventional Facilities Commissioning													
1.05.06 Commissioning	5,000	12,744	0	7,744	12,744	25,000	55,075	36,518	30,075	18,557	578,000	578,000	0
WBS[3]Totals:	5,000	12,744	0	7,744	12,744	25,000	55,075	36,518	30,075	18,557	578,000	578,000	0
WBS[2]Totals:	**6,063,396**	**9,227,852**	**6,872,151**	**3,164,456**	**2,355,702**	**52,871,205**	**52,224,605**	**49,843,953**	**-646,600**	**2,380,652**	**256,330,119**	**275,676,045**	**-19,345,926**
1.06 Pre-Operations													
1.06.01 Management - Pre Ops													
WBS[3]Totals:	0	0	0	0	0	0	0	0	0	0	20,170,700	20,170,700	0
1.06.02 Accelerator Systems - Pre Ops													
WBS[3]Totals:	0	0	0	0	0	0	0	0	0	0	17,071,591	17,071,591	0
1.06.03 Experimental Facilities - Pre Ops													
WBS[3]Totals:	0	0	0	0	0	0	0	0	0	0	3,823,660	3,823,660	0
1.06.04 Spares													
1.06.04 Spares	0	0	0	0	0	0	0	0	0	0	9,134,454	9,134,454	-0
WBS[3]Totals:	0	0	0	0	0	0	0	0	0	0	9,134,454	9,134,454	-0
WBS[2]Totals:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**50,200,405**	**50,200,405**	**0**
b. Cost of Money	0	0	0	0	0	0	0	0	0	0	0	0	0
c. Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0	0	0
d. Undist. Budget											0	0	0
e. Sub Total	9,985,545	13,640,470	9,760,084	3,654,925	3,880,386	162,854,477	155,908,438	150,172,797	-6,946,039	5,735,641	757,534,440	785,203,115	-27,668,675
f. Contingency / Management Reserve.											154,465,560		
g. Total	9,985,545	13,640,470	9,760,084	3,654,925	3,880,386	162,854,477	155,908,438	150,172,797	-6,946,039	5,735,641	912,000,000		

8. PERFORMANCE DATA as of October 31, 2009

NSLS-II ARRA	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION
WBS[2]			ACTUAL					ACTUAL			
WBS[3]	BUDGETED COST		COST	VARIANCE		BUDGETED COST		COST	VARIANCE		
Cost Account	WORK	WORK	WORK			WORK	WORK	WORK			BUDGETED
ITEM	SCHEDULED	PERFORMED	PERFORMED	SCHEDULE	COST	SCHEDULED	PERFORMED	PERFORMED	SCHEDULE	COST	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(14)
A ARRA											
1.05.03.02.01 General Requirements	0	0	0	0	0	4,239,243	4,239,243	3,293,780	0	945,463	4,851,187
1.05.03.02.02 Site Work	0	148,792	148,791	148,792	1	1,958,744	1,984,016	1,898,044	25,272	85,972	2,403,575
1.05.03.02.03 Pentant 1 and Service Building	1,277,005	1,783,805	1,752,746	506,800	31,059	4,463,922	4,249,017	4,104,131	-214,906	144,886	18,603,865
1.05.03.02.04 Pentant 2 and Service Building	180,385	239,907	215,424	59,522	24,483	1,751,906	1,160,757	1,145,396	-591,149	15,362	14,982,878
1.05.03.02.05 Pentant 3 and Service Building	249,444	706,140	695,674	456,696	10,466	1,149,488	981,185	988,310	-168,303	-7,125	9,850,947
1.05.03.02.06 Pentant 4 and Service Building	203,757	46,679	46,679	-157,078	0	726,372	272,549	292,762	-453,822	-20,213	2,138,574
1.05.03.02.07 Pentant 5 and Service Building	551,279	301,435	163,019	-249,843	138,416	2,636,080	2,117,323	1,966,487	-518,757	150,836	6,751,629
1.05.03.02.08 Injection Building	2,704	32,104	51,168	29,400	-19,064	192,403	368,745	411,172	176,342	-42,427	5,295,698
1.05.03.02.09 RF and Compressor Building	133,196	93,483	53,422	-39,713	40,061	960,095	705,024	654,529	-255,072	50,495	5,164,005
1.05.03.02.10 Lobby	2,380	2,380	2,380	0	0	105,589	106,719	104,339	1,130	2,380	3,071,094
1.05.03.02.11 Cooling Tower and Process Water	0	22,208	22,208	22,208	0	63,568	54,556	47,796	-9,012	6,760	4,075,953
1.05.03.02.12 Underground Mechanical Utilities	0	231,082	266,082	231,082	-35,000	722,916	1,622,626	1,565,788	899,710	56,838	8,478,155
1.05.03.02.13 Site Electrical Utilities	761,831	222,398	335,634	-539,433	-113,236	2,183,602	1,387,415	1,609,869	-796,187	-222,454	9,356,456
1.05.03.03 Electrical Substation and Feeder (Contract)	-236,412	83,067	2,540	319,479	80,527	278,739	393,744	175,621	115,005	218,123	2,943,143
1.05.03.04 Chilled Water Plant (Conract)	-1,563,558	155,080	305,303	1,718,638	-150,223	272,641	155,080	554,911	-117,561	-399,831	9,200,000
1.05.03.06.01 LOB 1	0	0	0	0	0	0	0	0	0	0	10,241,494
1.05.03.06.02 LOB 5	0	0	0	0	0	0	0	0	0	0	10,241,494
1.05.03.06.03 LOB 4	0	0	0	0	0	0	0	0	0	0	5,501,020
A ARRA	**1,562,010**	**4,068,561**	**4,061,070**	**2,506,551**	**7,491**	**21,705,309**	**19,797,998**	**18,812,935**	**-1,907,311**	**985,063**	**133,151,167**